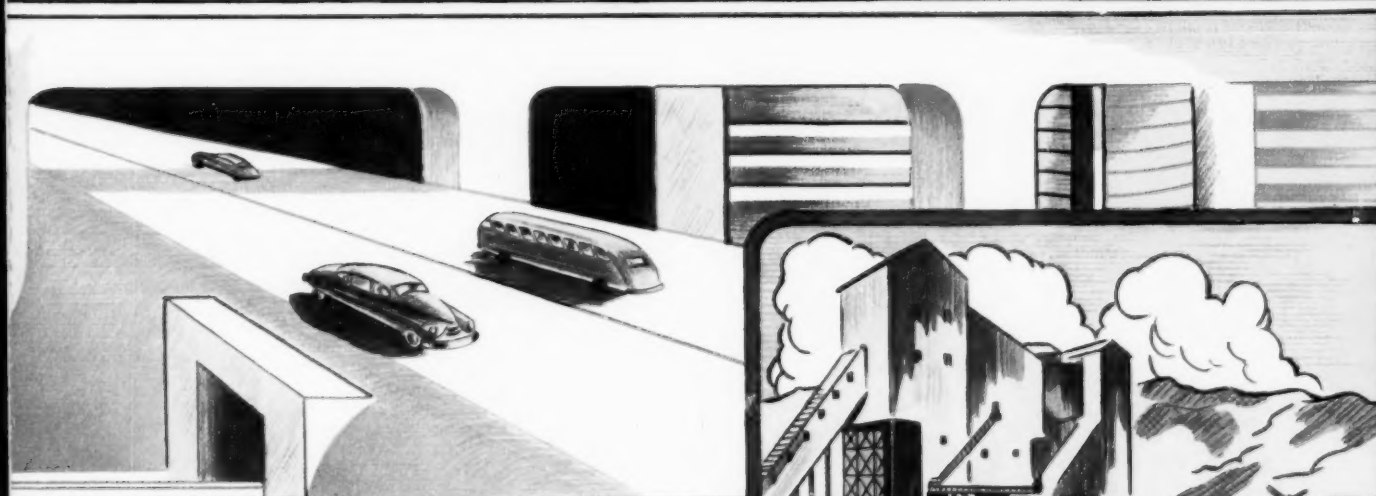


# *The* CRUSHED STONE JOURNAL



PUBLISHED QUARTERLY

## In This Issue

March 1957

- Miami Beach Convention Draws Record Attendance
- James Savage—In Memoriam
- Crushed Stone in the New Highway Program
- Significance to Stone Producers of Flexural Strength Specifications for Pavement Concrete

Announcing

*The  
41st Annual Convention*

**NATIONAL CRUSHED STONE ASSOCIATION  
and  
Manufacturers Division Biennial Exposition**

**February 17, 18, 19, 1958 • Conrad Hilton, Chicago**



The Conrad Hilton, Chicago, Ill.

*All Are Invited*

Everyone Interested in the Crushed Stone Industry Should Attend

*It's Not Too Early To Make Your Plans Now*

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# The Crushed Stone Journal

Official Publication of the NATIONAL CRUSHED STONE ASSOCIATION

J. R. BOYD, Editor

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## NATIONAL CRUSHED STONE ASSOCIATION



1415 Elliot Place, N. W.  
Washington 7, D. C.

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### OFFICERS

N. E. KELB, President  
O. E. BENSON, Vice President  
JAMES SAVAGE, Treasurer  
J. R. BOYD, Executive Director  
J. E. GRAY, Engineering Director  
A. T. GOLDBECK, Engineering Consultant

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H. A. CLARK      A. W. McTHENIA  
H. CLINTON      W. C. ROWE  
R. G. L. HARSTONE      N. SEVERINGHAUS  
B. G. WOOLPERT

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N. E. KELB, Chairman  
O. E. BENSON      J. V. OWENS  
CLARENCE CAMP, II      R. S. REIGELUTH  
T. C. COOKE      W. C. ROWE  
W. P. FOSS, III      N. SEVERINGHAUS  
WAYNE W. KING      W. S. WESTON, JR.

## Contents



	Page
Miami Beach Convention Draws Record Attendance . . . . .	3
James Savage—In Memoriam . . . . .	12
Crushed Stone in the New Highway Program By A. C. Clark . . . . .	14
Significance to Stone Producers of Flexural Strength Specifications for Pavement Concrete By A. T. Goldbeck . . . . .	17
Manufacturers Division Directory . . . . .	23





**N. E. KELB**

President  
Cumberland Quarries, Inc.  
Indianapolis, Indiana



Re-elected President  
**NATIONAL CRUSHED STONE  
ASSOCIATION**

by the Board of Directors  
Miami Beach, Florida

January 14, 1957

**WAYNE W. KING**

W. S. Tyler Company  
Cleveland, Ohio



Re-elected Chairman  
**MANUFACTURERS DIVISION**

at its Annual Meeting  
Miami Beach, Florida

January 17, 1957



# THE CRUSHED STONE JOURNAL

WASHINGTON, D. C.

Vol. XXXII No. 1

PUBLISHED QUARTERLY

MARCH 1957

## Miami Beach Convention Draws Record Attendance

**Norman E. Kelb Re-Elected NCSA President**  
**Wayne W. King Again Heads Manufacturers Division**

**A**LL previous National Crushed Stone Association attendance records for an off-show year convention were broken on January 15, 16, and 17, 1957, when 837 delegates and guests gathered at the beautiful new Americana Hotel, Bal Harbour, Miami Beach, Florida, for the 40th Annual Convention of NCSA.

The popularity of every phase of the activities strongly indicated that this 1957 Convention was one of the best in Association history. The well-rounded program was extremely well received with large audiences for each session. Sustained interest was accorded the top flight talks by the guest speakers and members of the crushed stone industry, and much credit is due the Convention Arrange-

ments Committee, under the able Chairmanship of A. L. Worthen, for their efforts in arranging such a successful program.

With this the first NCSA Convention ever held in Florida, the record attendance can indeed be considered exceptional. Not only was there excellent representation from practically every geographic section of the United States, but it was also gratifying to again have the pleasure of welcoming member companies from the Dominion of Canada. Particularly noteworthy was the presence of two guests from Great Britain, Mr. and Mrs. Thomas Swan. Mr. Swan, Managing Director of Thomas Swan & Company, Ltd., Chorley Wood, Herts, England, was emphatic in his praise of our Convention, and

### Record Attendance Marks Conclusion of 40th Annual Convention

Among those enjoying the NCSA Dinner Dance, Thursday evening, January 17, 1957, Bal Masque Room, Americana Hotel, Miami Beach, Florida





T. C. COOKS  
Lynn Sand and  
Stone Co.  
Swampscott, Mass.  
Immediate Past  
President



N. E. KELB  
Cumberland Quarries, Inc.  
Indianapolis, Ind.  
President  
National Crushed Stone  
Association



O. E. BENSON  
General Crushed Stone Co.  
Easton, Pa.  
Vice President  
National Crushed Stone  
Association



W. S. WESTON, JR.  
Weston &  
Brooker Co.  
Columbia, S. C.  
Elected Past  
President



CLARENCE CAMP, II  
Camp Concrete  
Rock Co.  
Ocala, Fla.

## EXECUTIVE COMMITTEE

of the  
NATIONAL CRUSHED STONE ASSOCIATION  
for the year 1957



W. P. FOSS, III  
New York Trap  
Rock Corp.  
New York, N. Y.



WAYNE W. KING  
W. S. Tyler Co.  
Cleveland, Ohio  
Chairman  
Manufacturers Division



J. V. OWENS  
Eastern Rock  
Products Inc.  
Utica, N. Y.



R. S. REIGELUTH  
New Haven Trap  
Rock Co.  
New Haven, Conn.



W. C. ROWE  
Rowe Contracting Co.  
Malden, Mass.



NELSON SEVERINGHAUS  
Consolidated  
Quarries Corp.  
Decatur, Ga.



brought with him greetings and best wishes from the British Institute of Quarrying of which he is a Vice President, the Federation of Coated Macadam Industries, and the British Slag Federation.

The general sessions included many subjects of practical value, and in order that everyone may benefit from the full text, several of the papers presented at the Convention are reproduced in this issue of the Journal while others will be distributed in mimeographed form.

The Special Operating Session of Thursday morning attracted one of the largest audiences of the Convention program with over 300 in attendance. Chairman C. E. Hogeboom and the Operating Session Committee are also in line for commendations for their planning and presentation of eight practical and important subjects which will soon be available in printed form.

Visual variety in the pictorial sense was provided through the showing of four films, all of which were well attended. Especial interest was evidenced in the excellent public relations film, "Mountain To Main Street," provided through the courtesy of the New York Trap Rock Corporation and now available to NCSA members through request to Association headquarters in Washington.

#### **Norman E. Kelb Re-Elected President**

The Board of Directors of NCSA, elected by mail ballot prior to the Convention, held its organizing meeting on Monday afternoon, January 14, 1957, at

which tribute was paid to the memories of Russell Rarey and Harry Brandon.

In accordance with By-Law provisions, the Board elected the President, Executive Committee, an additional Director, and other officers for the business year of 1957.

Only one name was placed in nomination for the Presidency, that of Norman E. Kelb, and after a motion closing nominations for this office had been duly seconded and approved, Mr. Kelb, President of the Cumberland Quarries, Inc., of Indianapolis, Indiana, was unanimously re-elected as President of the National Crushed Stone Association for 1957. In accepting the honor, Mr. Kelb expressed his deep appreciation for the wholehearted cooperation of the Board during the past year, thanked the Board for their confidence, and said he would continue to do his best during his second term of office.

The next order of business was the election of the Vice President, a new office established in accord with an amendment made to the By-Laws at the 1956 Midyear Meeting of the Board of Directors. Again, after one name had been placed in nomination, it was moved, seconded, and passed to close the nominations, and O. E. Benson, President, General Crushed Stone Company, Easton, Pennsylvania, was unanimously elected as Vice President. Mr. Benson, too, stated his appreciation and pledged his best efforts to the President, the Board, and the membership.



**Organizing Meeting of Newly Elected NCSA Board of Directors**



**Special Operating Session Panel Members and Presiding Officer**

Left to Right: JOHN CHULA, Vice President in Charge of Operations, Bradford Hills Quarry, Inc., E. Petersburg, Pa.; JOHN BRATTON, JR., General Manager, Superior Stone Co., Raleigh, N. C.; J. E. GRAY, Engineering Director, NCSA, Washington, D. C.; C. E. HOGEBOOM, Chief Engineer, Consumers Co., Chicago, Ill., *Presiding*; M. HANKIN, JR., Executive Vice President, North Jersey Quarry Co., Morristown, N. J.; JOHN KAWASKE, General Superintendent, Callanan Road Improvement Co., South Bethlehem, N. Y.; L. J. BURRESS, Chief Engineer, Weston & Brooker Co., Columbia, S. C.

### Election of Executive Committee and Directors

From those members of the Board eligible to serve on the Executive Committee, eleven names were placed in nomination with six to be elected. After secret ballot, the six receiving the highest number of votes cast were declared elected. Following in alphabetical order are the six elected members of the Executive Committee: Clarence Camp, II, W. P. Foss, III, J. V. Owens, R. S. Reigeluth, W. C. Rowe, and Nelson Severinghaus. For Messrs. Camp, Reigeluth, and Severinghaus, this marks their first appearance as members of the Executive Committee. Messrs. Foss, Owens, and Rowe were returned by re-election.

From the category of voting Past Presidents, W. S. Weston, Jr., was a unanimous choice for election to the Executive Committee.

Serving on the Executive Committee in an ex officio capacity will be the President, the Vice President, the Immediate Past President of NCSA, and the Chairman of the Manufacturers Division. The full personnel for 1957 is as follows:

### EXECUTIVE COMMITTEE

Norman E. Kelb, Cumberland Quarries, Inc., Indianapolis, Ind., *Chairman*  
O. E. Benson, General Crushed Stone Co., Easton, Pa.  
Clarence Camp, II, Camp Concrete Rock Co., Ocala, Fla.  
T. C. Cooke, Lynn Sand & Stone Co., Swampscott, Mass.  
W. P. Foss, III, New York Trap Rock Corp., New York, N. Y.  
Wayne W. King, W. S. Tyler Co., Cleveland, Ohio  
J. V. Owens, Eastern Rock Products, Inc., Utica, N. Y.  
R. S. Reigeluth, New Haven Trap Rock Co., New Haven, Conn.  
W. C. Rowe, Rowe Contracting Co., Malden, Mass.  
Nelson Severinghaus, Consolidated Quarries Corp., Decatur, Ga.  
W. S. Weston, Jr., Weston & Brooker Co., Columbia, S. C.

James H. Grove, Jr., Treasurer, M. J. Grove Lime Company, Frederick, Maryland, was a unanimous choice for re-election as a Director-at-Large from the active membership.



EMIL BERRY  
Jefferson County Stone Co.,  
Anchorage, Ky.  
Newly Elected to NCSA  
Board

Two new members of the Board, elected by mail ballot prior to this meeting, were recognized and extended a cordial welcome by President Kelb. New members of the Board are:

Emil Berry, Jefferson County Stone Co., Anchorage, Ky.  
F. E. Weldon, Fanwood Stone Crushing & Quarry Co., Westfield, N. J.

### Other Elections

Henry E. Rodes, Nashville, Tennessee; Stirling Tomkins, New York, New York; O. M. Stull, Buchanan, Virginia; and Harold Williams, Boston, Massachusetts, were unanimously re-elected as Honorary Members of the Board.

James Savage, Treasurer, and J. R. Boyd, Secretary, were also unanimously re-elected.

A mail ballot election, conducted prior to this Board meeting, resulted in the election of the nine Regional Vice Presidents of NCSA. A picture of each Regional Vice President, to-



JAMES SAVAGE  
Buffalo Crushed Stone Corp., Buffalo, N. Y.  
Re-elected Treasurer



## Regional Vice Presidents for 1957 of the National Crushed Stone Association



**A. J. CAYIA**  
**Northern**  
Michigan,  
Minnesota,  
Montana, Nebraska,  
North Dakota,  
South Dakota,  
Wisconsin



**H. A. CLARK**  
**Midwestern**  
Illinois, Indiana,  
Iowa, Kansas,  
Missouri



**H. CLINTON**  
**Southwestern**  
Arizona, Arkansas,  
Louisiana,  
New Mexico,  
Oklahoma, Texas



**R. G. L. HARSTONE**  
**British  
Commonwealth**  
Dominion of Canada,  
United Kingdom,  
Australia,  
New Zealand,  
Union of  
South Africa



**J. L. HOLDEN**  
**Eastern**  
Delaware,  
Maryland,  
New Jersey,  
New York,  
Pennsylvania,  
District of Columbia



**A. W. McTHENIA**  
**Central**  
Kentucky, Ohio,  
Tennessee,  
West Virginia



**W. C. ROWE**  
**New England**  
Connecticut, Maine,  
Massachusetts,  
New Hampshire,  
Rhode Island,  
Vermont



**N. SEVERINGHAUS**  
**Southeastern**  
Alabama, Florida,  
Georgia,  
Mississippi,  
North Carolina,  
South Carolina,  
Virginia



**B. G. WOOLPERT**  
**Western**  
California,  
Colorado, Idaho,  
Nevada, Oregon,  
Utah, Washington,  
Wyoming,  
Territory of Hawaii

gether with the area designated for each Region, will be found on page 7 of this issue of the Journal. Making his first appearance as a Regional Vice President is J. L. Holden, elected at the organizing meeting of the Board on January 14, 1957. Mr. Holden, who will represent the Eastern Region, replaces O. E. Benson, new NCSA Vice President.

### Ladies Also Present in Record Numbers

The ladies were not to be outdone in the matter of setting new attendance records. The welcome presence of 246 ladies at this Convention eclipsed by more than 100, their previous high attendance established in 1956 at Chicago. Along with their three gracious and charming hostesses—Mrs. N. E. Kelb, Mrs. Clarence Camp, II, and Mrs. Wayne W. King, the ladies found much of interest and pleasure in their special program which included coffee hours and teas, swimming and sunning, sightseeing trips by land and water, and the several NCSA luncheons and social functions.



Hostesses for Ladies Entertainment

Left to Right: MRS. WAYNE W. KING, MRS. N. E. KELB, MRS. CLARENCE CAMP, II

### Social Hours Particularly Enjoyable

The social side of this Convention proved more popular than ever before with new attendance marks recorded for both the Tuesday and Thursday evening functions. Gentle tropical zephyrs and temperatures in the mid-seventies accompanied the famed Miami moon which shone brilliantly for the Tuesday evening outdoor NCSA Fiesta. A record gathering of over 700 was present for the Fiesta party and

many were the complimentary remarks as to the dinner, dancing, and special entertainment which included a water show.

This spirit of gaiety was very much in evidence on Thursday evening too, when an unexpected advance ticket sale to accommodate over 690 persons necessitated a change from the regularly scheduled Banquet to the less formal atmosphere of a supper club. Dinner, dancing, and nationally known entertainers in the beautiful Bal Masque Room were thoroughly enjoyed by those present. The attendance on Thursday evening established a new high for an NCSA convention closing function.

### Manufacturers Division Re-Elects Wayne W. King as Chairman

The annual luncheon and business meeting of the Manufacturers Division, held Thursday, January 17, 1957, was well attended with some 110 representatives of member companies present.



Manufacturers Division Board of Directors for 1957

Top Row, left to right: H. R. HARRINGTON, Goodyear Tire & Rubber Co., Inc., Akron, Ohio; W. E. COLLINS, JR., Atlas Powder Co., Wilmington, Del.; R. S. WELLS, Stephens-Adamson Mfg. Co., Aurora, Ill.; R. W. REEDY, Kennedy-Van Saun Mfg. & Eng. Corp., Danville, Pa.; F. E. BRIBER, JR., Allis-Chalmers Mfg. Co., Milwaukee, Wis. Middle Row, left to right: J. R. BOYD, Secretary, Manufacturers Division, NCSA, Washington, D. C.; L. A. EIBEN, Northern Blower Co., Cleveland, Ohio; Mrs. E. S. GILL, Gill Rock Drill Co., Inc., Lebanon, Pa.; W. A. RUNDQUIST, Pioneer Engineering Works, Inc., Minneapolis, Minn.; B. R. MALONEY, E. I. du Pont de Nemours & Co., New York, N. Y. Bottom Row, left to right: L. C. MOSLEY, Marion Power Shovel Co., Marion, Ohio; N. E. KELB, Cumberland Quarries, Inc., Indianapolis, Ind., President, NCSA; WAYNE W. KING, W. S. Tyler Co., Cleveland, Ohio, Chairman; F. A. PAMPFEL, Chain Belt Co., Milwaukee, Wis.; L. A. RHODES, Stedman Foundry & Machine Co., Inc., Aurora, Ind.; G. D. FRAUNFELDER, Easton Car & Construction Co., Easton, Pa.



WAYNE W. KING  
W. S. Tyler Co.  
Cleveland, Ohio  
Chairman  
Manufacturers Division



W. E. COLLINS, JR.  
Atlas Powder Co.  
Wilmington, Del.



L. A. EIBEN  
Northern Blower Co.  
Cleveland, Ohio

## EXECUTIVE COMMITTEE

of the  
MANUFACTURERS DIVISION  
National Crushed Stone Association  
for the year 1957



N. E. KELS  
Cumberland Quarries, Inc.  
Indianapolis, Ind.  
President  
National Crushed  
Stone Association



R. D. KETNER  
General Electric Co.  
Schenectady, N. Y.



H. W. NEWTON  
Barber-Greene Co.  
Aurora, Ill.



W. A. RUNDQUIST  
Pioneer Engineering  
Works, Inc.  
Minneapolis, Minn.

Following luncheon, the Division, in its annual business meeting, paid tribute to the memories of Russell Rarey, Harry Brandon, A. G. Seitz, and H. M. Davidson, Chairman of the Division in 1930.

The report of the Nominating Committee, previously circulated by mail to all member companies, was presented by B. R. Maloney, Committee Chairman, and unanimously adopted as a result of floor action.

Wayne W. King of Baltimore, Maryland, was re-elected Division Chairman. In acceptance, Mr. King thanked the Division for their support and confidence, members of the NCSA for their cooperation, and declared his intent to continue efforts towards strengthening and improving the Division in every respect.

There follows a complete listing of those elected and their official designations for 1957 as presented by the Nominating Committee:

#### CHAIRMAN

Wayne W. King, W. S. Tyler Co., Cleveland, Ohio

#### VICE CHAIRMEN

W. E. Collins, Jr., Atlas Powder Co., Wilmington, Del.  
H. W. Newton, Barber-Greene Co., Aurora, Ill.  
W. A. Rundquist, Pioneer Engineering Works, Inc., Minneapolis, Minn.

#### REPRESENTATIVES ON NCSA BOARD OF DIRECTORS

L. A. Eiben, Northern Blower Co., Cleveland, Ohio  
R. D. Ketner, General Electric Co., Schenectady, N. Y.  
Wayne W. King, W. S. Tyler Co., Cleveland, Ohio

#### DIRECTORS

H. M. Albers, Kensington Steel, Division of Poor & Co., Chicago, Ill.  
F. E. Briber, Jr., Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
A. G. Crockett, Mack Trucks, Inc., Somerville, N. J.  
I. F. Deister, Deister Machine Co., Fort Wayne, Ind.  
E. T. Eggers, American Steel & Wire Division, United States Steel Corp., Cleveland, Ohio  
George D. Fraunfelder, Easton Car & Construction Co., Easton, Pa.  
E. S. Gill, Gill Rock Drill Co., Inc., Lebanon, Pa.  
J. W. Hardesty, Baldwin-Lima-Hamilton Corp., Lima, Ohio  
H. R. Harrington, Goodyear Tire & Rubber Co., Inc., Akron, Ohio  
W. B. Hicks, Hewitt-Robins Inc., Stamford, Conn.  
G. C. Holton, American Cyanamid Co., New York, N. Y.  
J. M. Hume, Pettibone Mulliken Corp., Chicago, Ill.  
G. H. Keppel, Birdsboro-Buchanan Crusher Dept., Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
K. F. Lange, Link-Belt Co., Chicago, Ill.  
B. R. Maloney, E. I. du Pont de Nemours & Co., New York, N. Y.  
L. L. Morgan, Caterpillar Tractor Co., Peoria, Ill.  
L. C. Mosley, Marion Power Shovel Co., Marion, Ohio  
F. A. Pampel, Chain Belt Co., Milwaukee, Wis.  
R. W. Reedy, Kennedy-Van Saun Mfg. & Eng. Co., Danville, Pa.  
L. A. Rhodes, Stedman Foundry & Machine Co., Inc., Aurora, Ind.  
H. H. Schaper, Smith Engineering Works, Milwaukee, Wis.  
H. R. Stickel, White Motor Co., Cleveland, Ohio  
C. S. Weber, Thew Shovel Co., Lorain, Ohio  
R. S. Wells, Stephens-Adamson Mfg. Co., Aurora, Ill.

As provided in Division By-Laws, the Chairman, Vice Chairmen, Division Representatives on the NCSA Board, and the President of NCSA are ex

Manufacturers Division, Annual Business Meeting Luncheon, Americana Hotel, Miami Beach, Fla., January 17, 1957



## NEWLY ELECTED TO MANUFACTURERS DIVISION BOARD



I. F. DEISTER  
Deister Machine Co.  
Fort Wayne, Ind.



W. B. HICKS  
Hewitt-Robins Inc.  
Stamford, Conn.



L. C. MOSLEY  
Marion Power Shovel Co.  
Marion, Ohio



R. W. REEDY  
Kennedy-Van Saun  
Mfg. & Eng. Co.  
Danville, Pa.

officio members of the Manufacturers Division Board of Directors. As Chairman of the Manufacturers Division, Mr. King is also an ex officio member of the Board of Directors of the National Crushed Stone Association.

Membership growth of the Division was also recognized at this meeting. F. E. Briber, Jr., reporting for the Membership Committee, introduced eight new members and reported that the present Division membership strength had now reached an all-time high of 116 members.

### Bell Mine Again Wins Safety Contest 30 Plants Honored at Luncheon

A feature of the Greeting Luncheon on Tuesday was the impressive ceremony at which well-deserved recognition and awards were presented to the 30 winning plants of the 1955 NCSA Safety Contest. Presentations were made by Walter A. Dearth of the NCSA Accident Prevention Committee.

Winner of top honors for the second successive year was the Warner Company's Bell Mine, Bellefonte Division, Bellefonte, Pennsylvania which will again have its name inscribed on the handsome bronze plaque, donated by the *Explosive Engineer* magazine for its outstanding accomplishment of 264,075 man-hours worked without a lost-time accident. The Bell Mine's 1954 Contest winning total was 246,689 man-hours worked without a lost-time accident.

The Bell Mine employees, along with the Warner Company, are to be highly commended for the remarkable 2-year total of 510,764 man-hours worked without a lost-time accident during the contest years of 1954 and 1955.

Reproductions of the plaque in the form of Certificates of Honorable Mention were presented to

representatives of each perfect-record plant participating in the contest. In addition, the employees of each winning plant are presented with a certificate by the National Crushed Stone Association as recognition of the important part they played in compiling such impressive safety records.

(Continued on Page 22)



Representatives of Winning Plants 1955 NCSA Safety Contest

Top Row, left to right: BURR SHAVER, Supt., White Haven Quarry, General Crushed Stone Co., White Haven, Pa.; JESS HANEY, Supt., Prospect Stone Plant No. 6, Eastern Rock Products, Inc., Prospect, N. Y.; JOHN BRATTON, JR., Gen. Mgr., Superior Stone Co., Raleigh, N. C.; A. W. ZIMMER, JR., Mgr., Cape Girardeau Mine, Federal Materials Co., Cape Girardeau, Mo.; WALTER C. METZ, Supt., Ives Quarry, Consumers Co., Racine, Wis. Second Row, left to right: F. H. NEWCOMER, Safety Director, Bonne Terre Quarry, Valley Dolomite Corp., Bonne Terre, Mo.; MYRON FILKINS, Plant Representative, Plant No. 1 Quarry, Callanan Road Improvement Co., South Bethlehem, N. Y.; CHARLES F. BASS, Supt., Plant No. 4 Quarry, New Haven Trap Rock Co., Plainville, Conn.; WHIT J. WISE, Vice President, Southwest Stone Co., Dallas, Texas; JOHN H. MCKERNAN, Supt., Plant No. 1 Quarry, New Haven Trap Rock Co., Wallingford, Conn.; HARRY MCGUIRK, Supt., Glen Mills Quarry, General Crushed Stone Co., Glen Mills, Pa.; GEORGE B. PHILLIPS, Assistant Gen. Supt., Standard Lime and Cement Co., Martinsburg, W. Va.; JAMES L. HOLDEN, Sec., Genesee Stone Products Corp., Batavia, N. Y. Bottom Row, left to right: ROBERT L. WALKER, Mgr. of Operations, Federal Crushed Stone Corp., Buffalo, N. Y.; RALPH E. ROSCOE, Vice President (Ret.), Bessemer Limestone and Cement Co., Bessemer, Pa.; EMIL BERRY, President, Jefferson County Stone Co., Anchorage, Ky.; JOE O. SHEROD, Mgr., Lime Division, Warner Co., Philadelphia, Pa.; W. E. SCHMIDT, Vice President, Columbia Quarry Co., St. Louis, Mo.; WOODROW D. POOLE, Quarry Foreman, Security Quarry, North American Cement Corp., Security, Md.





**James Savage**  
**1869 - 1957**

**J**AMES SAVAGE, beloved Treasurer of the National Crushed Stone Association, and actively identified with the crushed stone industry for over a half century, has embarked on that journey from which no traveler returns. His passing must have been just as he wished it—active to the very end.

Jim, as he was widely and affectionately known by his many friends throughout the industry, attended our 40th Annual Convention in Miami Beach, Florida, during the middle of January. He seemed, for his years, to be in very good health and was in excellent spirits.

Endeared to all who knew him for his friendly and lovable personality and for his wise counsel in connection with Association affairs, NCSA has lost, in his passing, one of its most loyal and devoted supporters. Jim never lost his enthusiasm for living—he was perennially young and thoroughly enjoyed life to the very end.

Our hearts are deeply saddened by his death. No longer can we anticipate at our meetings his friendly smile and warm hand clasp. Jim, we bid you an affectionate farewell, consoled in part with the thought that the imprint of your personality will ever remain a fragrant memory in the hearts of those who knew you.

On his return from the Miami Beach Convention Jim developed a slight cold which gradually became worse. On Saturday, February 2, his Doctor, who had been treating him, and Ralph F. Peo, President of his company, persuaded him to go to the hospital for a complete check-up. Jim followed their suggestion and upon completion of the examinations and tests, although advised by the hospital physicians to remain in the hospital, refused, saying, "I have never stayed in the hospital and I am too old to begin now." He returned to the Buffalo Athletic Club, where he had resided for

over 15 years, with orders from his Doctor and advice from his friends, to stay in bed. To this he did not agree.

It seems that for many years Jim has belonged to a group of about 30 men who once a month have a luncheon at the Buffalo Athletic Club and, in keeping with a tradition of long standing, celebrate at a dinner held each month the birthdays of all the members of the group which occur in that month. Jim would have been 88 on February 28, and he attended the dinner given in his honor by the group on Monday evening, February 4. He also attended a luncheon at the Chamber of Commerce on Wednesday, February 6, and on Wednesday night attended a dinner of the "Suckers' Roundtable" (a whimsical name given to a group of the older men at the Buffalo Athletic Club.)

On Thursday morning, February 7, his Doctor called on him and advised him to stay in his room. This advice he also refused to follow and shortly departed for his office some four or five blocks from the Club. The elevator took him to his floor and he had walked almost to his office door when he was stricken. The strain proved too much and at 11:25 a.m., on Thursday, February 7, 1957, he died of heart failure.

James Savage first became identified with the crushed stone industry in 1904, when he founded the Buffalo Crushed Stone Company. Several years later he became partner in the same company with the late F. W. Schmidt of Summit, New Jersey, fifth President of the National Crushed Stone Association, who occupied that office in 1923. Following Mr. Schmidt's death, Mr. Savage remained in partnership with the Schmidt family and several years later the General Crushed Stone Company of Easton, Pennsylvania, entered the partnership. In October 1954, Frontier Industries, which later became Houdaille Industries, Inc., purchased the Buffalo Crushed Stone Company. Mr. Savage was Secretary-Treasurer of the company during most of his 53 years with the organization. Two years ago he became Chairman of the Board of the Buffalo Crushed Stone Corporation, a subsidiary of Houdaille Industries, Inc., and occupied that position at the time of his death.

His identity with the National Crushed Stone Association dates from its founding when he joined with a small but farsighted group of crushed stone producers to organize the Association in 1918. At the organizing meeting, held in January 1918, he

was elected to its first Board of Directors and continuously served on that body until the time of his death.

Mr. Savage first became Treasurer of the Association in 1924, serving until 1928. He was re-elected to the Office of Treasurer in 1945 and served continuously in that capacity until his death.

Outside of his business interests, Mr. Savage had established a nationwide reputation in the field of ornithology. He was a founder of the Buffalo Ornithological Society, the Buffalo Audubon Society, and was a life member of the American Ornithologists' Union, the highest scientific organization in the field.

Mr. Savage was born in South Buffalo where he received his elementary and high school training. He subsequently took his college work in Michigan. After graduation he became a surveyor and his assignments included surveying for the old Buffalo Railroad and interurban trolley lines.

Funeral services were held at 10:30 a.m., on Saturday, February 9, 1957, in St. Thomas Episcopal Church, South Buffalo. The deeply impressive ceremony was conducted by the Right Reverend Lauriston L. Scaife, Bishop of Western New York, assisted by the Reverend Burtis M. Dougherty, Rector of the Church, which was filled to capacity with friends from far and near.

Mr. Savage had long been active in the affairs of his church and community and Bishop Scaife during the funeral service paid the following tribute to his memory:

"As a churchman he received the Bishop's Medal in recognition of more than 60 years of leadership in St. Thomas Church, 50 of which he served as senior warden. The community has long been the beneficiary of his generous philanthropy. His friendly counsel and modest manner endeared him to many people who I am sure join me in this expression of our sorrow at his death."

We, too, who knew him over so many years of active participation in the affairs of the National Crushed Stone Association, record his passing, deeply saddened by the knowledge that we have lost as fine a friend as a man can have.

We are advised that there are no survivors as James Savage was the last of his line.

## Crushed Stone in the New Highway Program<sup>1</sup>

By A. C. CLARK

Assistant Commissioner  
U. S. Bureau of Public Roads  
Washington, D. C.

**A**T the 42nd Annual Convention of the American Association of State Highway Officials in Atlantic City, New Jersey, recently, the Federal Highway Administrator, John A. Volpe, speaking of the new road program stated, "It would be tragic indeed to jeopardize this magnificent program by any letdown of our supervisory or engineering standards. To the contrary, under the many-sided exigencies of this nationwide program, we shall need to lift our sights."

This statement should reassure any who may fear that the accelerated rate of highway construction required by the Federal-Aid Highway Act of 1956 will result in a sacrifice in quality. Those of you who are familiar with the efforts of not only the highway departments at federal, state, and local levels but also those of the National Crushed Stone Association, to continuously improve the standards of crushed stone for highway construction and maintenance should need no further reassurance.

Your constitution which was adopted when the National Crushed Stone Association was formed on January 16, 1918, describes cooperation with highway departments as one of the purposes for which the Association was founded. Later, when the Bureau of Engineering was established in your Association on October 15, 1925, the scope of this cooperation was outlined more specifically in the 14 points which were drafted as the objectives of the Bureau. Only three of these points will be cited to illustrate the high-caliber functions of this new Bureau:

"To review facts which have been established in respect to crushed stone through field and laboratory tests, in order that such facts may be made available and plainly set forth for the benefit of both producer and consumer.

"To interpret the results of researches on aggregates in an unbiased, straightforward manner to the

end that there will be no misunderstanding of the limitations and meaning of research results in the minds of the users or producers.

"In general, to advance the interest of crushed stone in a frank, straightforward, scientific, and ethical manner, free from bias and without recourse to unworthy attacks on any other aggregates."

No mention can be made of your Bureau of Engineering without recognition of its contributions to highway engineering in carrying out these functions under the directorship from the beginning until his retirement last August of A. T. Goldbeck. Mr. Goldbeck, incidentally, was formerly an employee of the Bureau of Public Roads, serving as Engineer of Tests from 1910 to 1913 and again from 1915 until he left in 1925 to go with your Association. During his last six years with our Bureau he was Chief of the Division of Tests and Research. That his contributions in the past 31 years to improvements in the use of crushed stone for highway construction and maintenance were of a high order is more than clear from the many honors that have been bestowed upon him.

Fortunately, the work of your Bureau of Engineering will continue under the capable direction of Joseph E. Gray who has succeeded Mr. Goldbeck. Fortunately too, Mr. Goldbeck will be available for consultation in the days ahead. Our combined cooperative efforts will be needed to achieve continued, progressive improvements in the use of crushed stone as the highway program accelerates.

That the highway program will accelerate is quite clear. The Congress in Section 116(a) of the Federal-Aid Highway Act of 1956 stated: "(a) Acceleration of Program.—It is hereby declared to be in the national interest to accelerate the construction of the federal-aid highway systems including the Interstate System, since many of such highways, or portions thereof, are in fact inadequate to meet the needs of local and interstate commerce, the national and the civil defense." In Section 116(b), Congress continued, "It is further declared that one of

<sup>1</sup>Presented at the 40th Annual Convention of the National Crushed Stone Association, Americana Hotel, Bal Harbour, Miami Beach, Florida, January 15-17, 1957

the most important objectives of this Act is the prompt completion of the Interstate System."

This Act, which was enacted into law last June, authorizes a total federal expenditure on the National System of Interstate and Defense Highways of \$24.8 billion. These authorizations are made in varying amounts for each fiscal year starting with the present up to and including 1969.

These federal funds will pay 90 per cent and in some states as much as 95 per cent of the cost of bringing the 41,000 miles of interstate highways up to standards adequate for the traffic they are estimated to carry in 1975. The states will participate in these improvements by contributing an estimated \$2.6 billion.

The Federal-Aid Highway Act of 1956 also provided additional authorizations for federal-aid primary and secondary systems as well as for extensions thereof in urban areas. The previous authorization for fiscal year 1957 was increased by \$125 million. New authorizations at higher levels were made for fiscal years 1958 and 1959 of \$850 million and \$875 million, respectively. These funds will be distributed as heretofore with 45 per cent for primary roads, 30 per cent to secondary roads and the remaining 25 per cent to urban roads. These funds will be matched equally by state funds except that a lesser contribution is required from states having public lands.

An additional authorization of \$103 million for each of the fiscal years 1958 and 1959 was made for forest roads and trails, national park roads, parkways, Indian reservation roads, and public lands highways.

The total expenditures for highways will be further increased by state, county, and local highway construction programs off the federal-aid systems. In addition, maintenance of all roads and streets should level off at about \$2 billion per year.

These trends are significant to you, for of all the various materials incorporated in highway construction, all types of aggregates and including those used in premixed bituminous material and ready-mixed concrete constitute the largest single element of cost. This cost amounts to one-fourth of that for all materials and supplies purchased by the contractor.

Within the aggregates used for highway construction and maintenance 40 per cent of the total tonnage consumed is crushed stone either purchased from commercial sources or produced on the site.

This was a finding<sup>2</sup> of the American Road Builders' Task Force No. 2 on Materials and Supplies. Incidentally, Mr. Goldbeck was Chairman of this Task Force and the Bureau of Public Roads participated in drafting its reports. These reports were requested by the President's Advisory Council on a National Highway Program and were presented at the hearings before both Houses of Congress which led to passage of the most important Federal-Aid Highway Act of 1956.

To return to our subject, 40 per cent of all aggregate consumed on highway construction and maintenance is crushed stone. With this factor, we can examine the aggregate requirements for the expanded highway construction program as currently estimated by the Bureau of Public Roads. The requirements of other highway programs as well as federal-aid are included in these estimates.

In 1957, it is estimated that 535 million tons of aggregates will be needed for highway construction. This includes aggregates which will be bought from commercial sources as well as those which will be produced on the project sites. Applying the 40 per cent factor shows that about 214 million tons of crushed stone are included, of which 90 million tons will probably be obtained from commercial sources. Maintenance requirements should remain about constant at approximately 54 million tons. This means that about 268 million tons of crushed stone will be needed for highway construction and maintenance in 1957. Assuming that 42 per cent of the crushed stone for maintenance is purchased from commercial sources as is the case on highway construction, it is probable that your industry will furnish about 113 million tons of crushed stone this year.

It is estimated that the crushed stone to be furnished annually will rise gradually to about 304 million tons to 1960. From 1960 through 1967, crushed stone requirements are estimated to remain at 304 million tons per year. After that, there may be a decline to about 269 million tons of crushed stone required for highway construction and maintenance.

These estimates are based upon information currently available. At the present time, however, the Bureau of Public Roads, with the cooperation of the state highway departments, is in the process of making detailed estimates of highway needs. As

<sup>2</sup> ARBA publication *The Highway Construction Industry as a Ten Year National Highway Program*. Part IV, p. 26



these new data become available some adjustments may be necessary in the current estimates of material requirements. It is the intent of the Bureau to review and make available such information at intervals so that you will be fully apprised.

These estimates of future requirements should be helpful to your industry in developing plans on a long-range basis to meet the expanded crushed stone needs for highway construction and maintenance. An early start in developing such plans is advisable for several reasons.

One reason for early, long-range planning is to give equipment manufacturers as much lead time as possible to meet your needs promptly. You will need new trucks, crushers, compressors, screens, and many other items both as replacements and for expansion. You will also need spare parts to keep your equipment aggregations in operation. You will help yourselves by advising manufacturers of your future needs at an early date so that they can adjust production schedules in time to meet your requirements.

Another reason stems from the fact that the population of the nation is increasing by about 3 million persons annually. To provide housing, schools, shopping centers, etc., an increasing amount of land in suburban and rural areas is being developed. In most of these areas, commercial activities become subject to zoning regulations. You may encounter some difficulty in such areas in obtaining the necessary permits to open new pits and quarries. By starting your planning now, you would have alternate locations where permits could be obtained.

Advanced planning will also put you in a better position to obtain sites for future expansion which have the most advantages for your operations. Securing such locations is important for many reasons. There must be a supply of good raw material, of course. Highway and other transportation facilities must be available within reasonable haul. A proposed site must be large enough to permit efficient operations.

Safety is also an important consideration. Access to highways should be so located that trucks can get on and off with minimum hazard to the traveling public and to your own employees. While on the subject of safety, your Association is to be highly commended for its efforts toward preventing accidents in operations performed by your member firms. These efforts have paid off in substantial reductions in the annual cost of accidents in the crushed stone industry.

Good public relations dictate that careful consideration be given to the environment around proposed locations and to trends toward its future development. The nearness of houses and other structures may result in damage, and ensuing claims, from ground vibration or air blast resulting from blasting operations.

Blasting techniques, however, have progressed in recent years. Not long ago, the Bureau of Public Roads assisted the New Jersey Department of Labor and Industry in drafting its present Rules and Regulations governing Blasting on Construction and Related Operations. As many of you know, these rules and regulations are permissive of the use of the accelerometer or seismograph to obtain ground vibration characteristics. The maximum safe amount of explosive that can be used safely at a given distance from a structure can be calculated from these data. More precise and efficient results can be obtained from each blast by this method as well as greater protection for surrounding structures. It might be well for those of you who are not now benefiting from such permissive rules and regulations, to seek their incorporation in those which govern your operations.

These are a few of the reasons why it is recommended that you plan now to meet the requirements of the new highway program. The funds for the Interstate System have been authorized through 1969 so you are assured of a long-range program.

Speaking of the Interstate System, you naturally have been very much interested in the features such as access control, multi-lane sections and others which mean more base, more surfacing, more structures, and hence more crushed stone per mile. This system has received the most publicity, for it stimulates the imagination. There may be a tendency, as a result, to overlook the fact that other federal-aid and non-federal-aid programs are also continuing and at higher levels. The crushed stone needs for these programs are also substantial. Your interest in these programs should not diminish. The technical developments in the use of crushed stone to which your Association has contributed in the past has been helpful, particularly to county and local highway departments. It is hoped that your contributions will continue.

In fact, each segment of the highway industry should endeavor to contribute continuously its share toward improving our methods, procedures and

*(Continued on Page 21)*



# Significance to Stone Producers of Flexural Strength Specifications for Pavement Concrete<sup>1</sup>

By A. T. GOLDBECK

Engineering Consultant  
National Crushed Stone Association  
Washington, D. C.

**Y**OUR Program Committee thought the subject of Flexural Strength Specifications for Pavement Concrete of sufficient importance to include it in our convention program. It is somewhat technical and would be intolerably so were I to attempt to bring into it the applicable methods of statistical analysis, but please relax, for I hope to make it as painless as possible in the short time available.

First, why do we specify flexural strength instead of compressive strength of pavement concrete? To answer that question, let's take a look at Figures 1 to 4 illustrating the significant forces which a concrete pavement must resist.

A concrete pavement is a slab and it acts like a wide beam. During the day its top surface temperature rises while the temperature next to the subgrade changes very little. The effect is to cause the slab to hump up at the center as shown in Figure 1. The dead weight of the slab now tends to

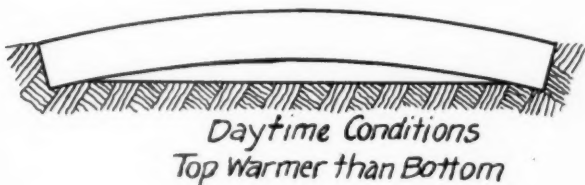


FIGURE 1

bend it back and consequently bending stresses are created within the slab. At night the top surface attains a lower temperature than the surface next to the subgrade and the slab now curls upward at its edges and corners as shown in Figure 2. Measurements have shown that the corners, especially, may actually leave the subgrade from the effects of this action. If the wheel loads of traffic now act on the corners of the slab as in Figure 3, quite evidently

they, together with the dead weight of the concrete, tend to bend the corners down and so, again, bending stress is created within the slab, tension at the

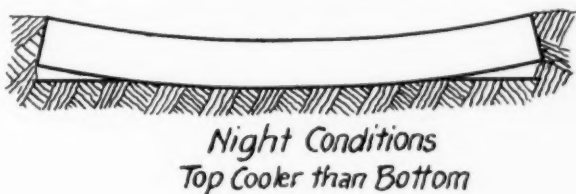


FIGURE 2

top, and compression at the bottom. Wheel loads may also act along the edges of the slab, tending to bend it down under the load, thereby creating tension at the bottom and compression at the top. (Figure 4)

But perhaps I should explain what I mean by internal stress in a beam due to bending or, indeed, what I mean by the term "stress." Stress is simply

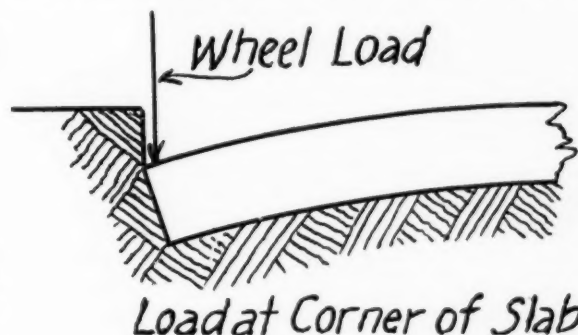


FIGURE 3

the internal force which is created in a structure through the application of some external force. For illustration, if a steel bar having a cross-sectional area of 2 sq in. is pulled with a force of 50,000 lb, it will have a tensile stress of 50,000 lb ÷ 2 sq in., or

<sup>1</sup> Presented at the 40th Annual Convention of the National Crushed Stone Association, Americana Hotel, Bal Harbour, Miami Beach, Florida, January 15-17, 1957

25,000 psi. The total stress in a 6 in. diameter concrete cylinder subjected to a load of 100,000 lb in a testing machine is 100,000 lb and the unit stress in pounds per square inch equals  $100,000 \div \text{area of cross-section } (28.3 \text{ sq in.}) = 3,530 \text{ psi}$ .

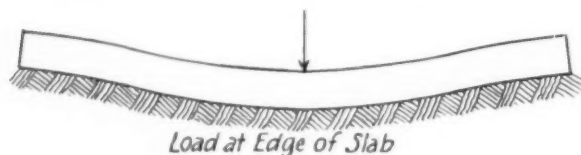


FIGURE 4

But these are illustrations of so-called direct stress without bending in which the unit stress is uniform throughout the cross-section. In a beam or slab subjected to bending, these internal forces or stresses vary from top to bottom, not only in amount but also in their character, for within the cross-section of a beam we have both compressive stresses and tensile stresses.

Let us consider a simple beam resting on supports at its ends and upon it two loads are applied at the third points. If the beam is 18 in. in span, the third points are 6 in. from each point of reaction as in Figure 5. If before applying the two loads  $P$ , straight

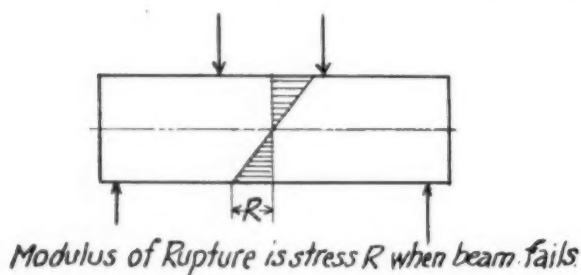


FIGURE 5

parallel vertical lines were drawn on one side of the beam, these lines, after the load is applied, would be closer together at the top of the beam and further apart at the bottom. If we used a fine measuring instrument, some form of strain gage, we could readily measure these changes in length which are called strains or deformations. So we have compressed the top portion of the beam and we have elongated the bottom portion, and thus we have created compressive stresses in the top and tensile stresses in the bottom. If we continue to increase the load on the beam, these internal stresses will increase and finally the beam will break, not because of lack of

compression resistance in the top "fibers" but rather because the concrete has failed in tension since the tensile strength of concrete is only a small fraction of its compressive strength. Beam resistance is expressed in terms of so-called modulus of rupture which is the maximum calculated tensile stress in the beam at the time of failure. One cannot use compressive strength as a measure of modulus of rupture because two concretes having equal resistance to compression may differ widely in resistance to bending.

The beam specimen above described is that used for determining modulus of rupture. I need not go into the mechanics involved in the theory for the calculation of modulus of rupture, but will merely state that for the usual 6 by 6 by 18 in. specimen, using third point loading, the calculated modulus of rupture,  $R$ , equals  $1/12 P$ , where  $P$  is the total load on the beam at failure. So if the load required to break the beam is 8,400 lb, the modulus of rupture is  $1/12$  of 8,400 = 700 psi.

#### Determination of Concrete Proportions for a Required Modulus of Rupture

The modulus of rupture of concrete is influenced by many factors such as the strength of the cement, the qualities of the aggregates, temperature of the soft concrete which affects the water-cement ratio and hence its strength, the temperature and degree of curing, condition of wetness of the hardened specimen when tested, and many other variables. It is the practice to determine the required proportions for the specified strength by means of laboratory tests made under carefully controlled conditions of mixing, proportioning, temperature, curing, etc. Generally four mixtures with different cement factors are made on three different days and specimens are broken at 7 and 28 days. Curves of water-cement ratio or of cement factor vs modulus of rupture may be drawn from which the cement factor required to give the required modulus of rupture may be obtained, and also the relationship of 7 to 28 day strengths is established. For illustration, the average results from a series of tests such as above described may be as follows:

Cement Factor Sacks per cu yd	Average Test Values Modulus of Rupture	
	7 Days	28 Days
5.5	470	595
6.0	510	630
6.5	540	660
7.0	560	690

Curves representing these results are plotted in Figure 6. Suppose it is required that the concrete

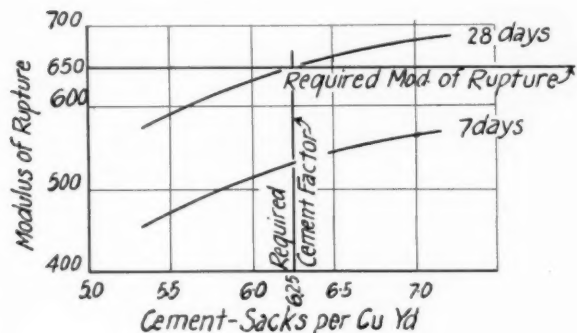


FIGURE 6

at 28 days have a modulus of rupture of 650 lb per sq in. It is evident from the curve that a cement factor of 6.25 sacks per cu yd is required to produce concrete having a modulus of rupture of 650 psi for these particular materials and under strict laboratory control.

### Field Specimens

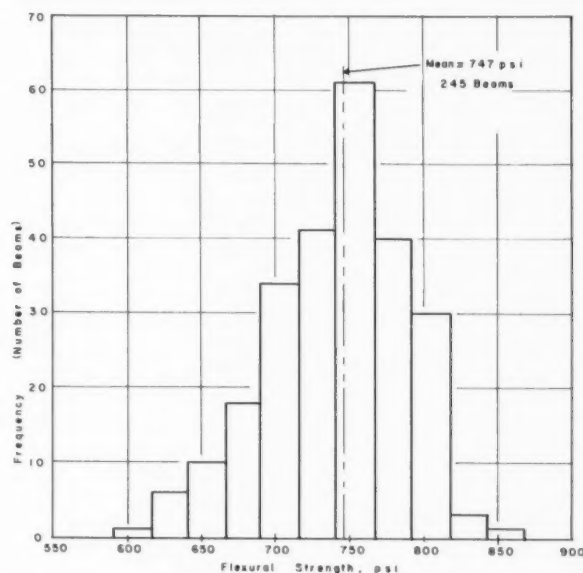
Now let us see what happens in the field. Specimens are made on the job from concrete going into the work. The air temperature and humidity may vary from day to day, gradations of aggregates may vary, and the cement, even though of the same brand as used in the initial laboratory tests, may be from a different bin. Also, the specimens may not be as expertly molded as in the laboratory and still other things may happen to disturb the strengths obtained from these field-made, laboratory-cured specimens, and consequently a rather wide range of results is obtained throughout the job.

The following table shows the range of assumed individual test results in a number of jobs. These ranges are typical of values which have been secured in the past under good conditions of control.

Flexural Strengths—Individual Beams (28 Day Tests)

Job No.	Individual Maximum psi	Individual Minimum psi	Mean psi	Number of Tests
1	817	539	708	75
2	811	505	677	62
3	862	648	732	205
4*	867	592	715	230
5	841	591	760	97

Note in the above table the range between the individual maximum and individual minimum results. For illustration, in Job 4 the individual maximum beam test of job made specimens was 879 and the individual minimum was 592.



28 Day Frequency Distribution Curve

FIGURE 7

Figure 7, which applies to Job 4, is a so-called frequency curve. This curve shows the frequency with which results within given ranges of maximum to minimum were obtained. Thus, reading from the curve there apparently were

1	result	between	range	of	592	to	617
6	"	"	"	"	617	"	642
10	"	"	"	"	642	"	667
18	"	"	"	"	667	"	692
34	"	"	"	"	692	"	717
41	"	"	"	"	717	"	742
61	"	"	"	"	742	"	767
40	"	"	"	"	767	"	792
30	"	"	"	"	792	"	817
3	"	"	"	"	817	"	842
1	"	"	"	"	842	"	867

Total 245 beams

The mean strength of these 245 beams is 747 psi. If the above extreme range in strength of the 245 beams made on this job was obtained, the question may well be asked, just what can be assumed to be the strength of this concrete? If the slab was designed on the assumption that the strength of the

concrete was the mean value, 747 psi, then apparently there would be roughly 115 beams out of 245 having less strength than the mean and hence it is to be assumed that a high percentage of the concrete had lower than the strength used in the design of the slab.

### Specification Requirements

A number of specifications merely say, in effect, "The concrete shall have a modulus of rupture of 700 psi when tested at the age of 28 days." Does that mean that all the field beams must average 700 psi, or does every beam have to comply?

The Bureau of Yards and Docks Specifications for Portland Cement Concrete Pavement for Airports, dated September 1952, reads as follows:

"3-02. *Flexural Strength.*—The 28-day minimum flexural strength required by the project drawings or specification shall be the strength used in the design calculations and will be verified, during the progress of the work at intervals, as directed, by testing standard beams made from concrete taken at the mixer. Generally, six beams will be made for each 100 cubic yards, or fraction thereof, of concrete placed in any one day. Tests will be made at 7 days and at 28 days using three beams for each test; the flexural strength will be the average of the three beams. After 24 hours the beams will be sent to the testing laboratory. The contractor shall furnish the necessary labor and facilities for taking the samples and handling and storing the beams at the site of the work. The Government will mold, ship, and test the beams. When a satisfactory relationship between 7-day and 28-day strengths has been established, the 7-day test results may be used as an indicator of the 28-day strengths. The making, curing, and testing of the specimens will be in accordance with ASTM methods Nos. C 31 and C 78."

If the concrete does not have the required strength, it is assumed that remedial measures to improve the strength are taken. This type of specification has merit for it requires daily testing of the field made concrete, and thus it aims to keep the strength as uniform as practicable throughout the job. That to me is what any concrete pavement specification should be aimed to accomplish.

It must be quite evident that the mean of all of the strength results obtained on any given project is not of primary importance if some days' results are very low and some very high, but rather is it highly important that the day to day results obtained as the average of several sets of at least three test specimens each be held above the strength value used for design purposes. Uniformity of strength from day to day should be attained so that there will result a pavement of uniform strength. So now the question arises as to what that strength value should be—how should it be arrived at?

Undoubtedly some low breaks occur in beam specimens just as they do in cylinders by virtue of the accidental occurrence of the unfavorable placement of the coarse aggregate in the rather restricted beam specimens. The standard beam is only 6 by 6 inches in cross-section and only the lower half of it, 6 by 3 inches, is in tension and most of the tensile stress occurs in the lower layers of the beam. Hence an unfavorable, accidental condition of the concrete in the lower layer may have a pronounced effect on the strength of that particular beam. But that same accidental condition in the pavement slab probably would not affect the slab strength because the high stress in the slab occurs over a much greater width than in the narrow beam test specimen. For this reason, the very lowest beam results probably have no significance. Hence, it is not particularly important if a single low result brings the average of three test values in a set of specimens below the specified value because that is probably due to an accidental condition in the beam. However, if low average strengths occur in consecutive sets of three specimens each, that is a sign that the concrete is substandard in strength and should be strengthened by an increase in cement factor. It is my present belief that the mean 28-day strength specified for any four consecutive sets of tests should be that used for the thickness design of the pavement slab.

### Conclusion

In conclusion, let me say to the stone producer that there are too many variables influencing the strength of concrete, whether in compression or flexure, to guarantee that a given cement factor, as determined by careful laboratory tests, will produce like strengths in the laboratory and in the field made concretes. The laboratory tests, how-



ever, will give a fair indication of the cement factor which should be used and likewise they give information useful for correcting the field proportions. On the other hand, laboratory tests, when made with competing materials, are very useful in showing in general what the respective proportions with these different materials should be for equal strength.

To those of you who are competing for concrete pavement jobs involving beam strength specifications, I hope I have shown you some of the difficulties. Be sure you thoroughly understand what the strength specifications require before you make any rash promises based on laboratory tests.

### ACI Honors A. T. Goldbeck

**A.** T. GOLDBECK, Engineering Consultant of the National Crushed Stone Association, was presented with the Henry C. Turner Medal on February 27, 1957, at the 53rd annual convention of the American Concrete Institute, Statler Hilton Hotel, Dallas, Texas.

This honor was given Mr. Goldbeck "in recognition of more than 40 years of quiet perseverance in the extension of our knowledge of concrete for use in highways and structures."

An ACI member since 1926, Mr. Goldbeck has also been a director, vice-president, and president. He has served on numerous ACI committees and is the author of eight ACI Journal papers.

### Crushed Stone in New Highway Program

*(Continued from Page 16)*

equipment. It is believed that further improvements can be made. For example, your Association was instrumental in developing the simplified sizes of stone we have today. It may be possible to further reduce the number of sizes without sacrificing quality. If so, benefits, in the form of lower production costs and reduced storage requirements should accrue.

Procedures, too, need streamlining. For instance, new materials, methods and equipment are being developed all the time. Some of these have resulted in greater efficiency in performing a highway construction or maintenance operation. However, in many instances before the benefits of the improvement can be realized on a nationwide basis, changes in highway department specifications are necessary.

A great many of these changes must be approved by the Bureau of Public Roads if federal-aid construction is involved. Usually specifications are reviewed and revised at intervals of two to five years. It is believed that the review of specifications should be a dynamic operation, keeping pace with new developments and incorporating the proven, desirable ones so that they can be utilized without a delay of several years as is sometimes the case under present procedures.

We in the highway industry have before us both an opportunity and a challenge. A great deal has been learned about the art of roadbuilding since the turn of the century. Methods, machines, and materials as well as engineering know-how have continuously improved. It is believed that with the cooperation of all segments of the highway industry, including your Association, the road program can be accelerated to the levels envisioned by Congress as essential to the national interest. It is believed that this acceleration will take place with no sacrifice in the finished product.

### Federal-State Highway Safety Efforts Increase

**M**ETHODS of decreasing highway casualties is currently attracting considerable attention at both the federal and state governmental levels.

On the national front, Representative Kenneth A. Roberts (Dem.-Ala.), who headed the Special Subcommittee on Traffic Safety in the second session of the 84th Congress, has introduced H.R. 101 to authorize the Committee on Interstate and Foreign Commerce to continue a study it began last year. Purpose of the study is to determine the "measures which may be taken to assist in eliminating such accidents or reducing their frequency and severity."

A select committee of five Representatives to conduct a full investigation into traffic safety would be created by H.R. 96, introduced by Representative Fogarty (Dem.-R. I.). The five Representatives, to be appointed by the Speaker of the House, would be required to make a final report prior to the close of the present Congress.

A "National Commission on Highway Safety," composed of 21 members to be appointed by the President from private or public life, has been proposed by S. J. Res. 10, introduced by Senator Saltonstall (Rep.-Mass.). It would be charged with



studying prevailing traffic conditions on Federal-aid highways, together with methods of improving safety conditions.

Senator Smith (Rep.-Me.) has introduced S.Res. 12, which would direct the Senate Committee on Labor and Public Welfare to study action that could be taken by the Federal Government to promote increased highway safety. House Concurring Resolution 26, proposed by Representative Multer (Dem.-N. Y.) states the sense of the Congress that laws should be uniformly adopted by each of the states.

Senator Capehart (Rep.-Ind.) has introduced S. 598 to authorize the President to present medals of honor to persons performing heroic acts in preventing serious highway accidents, or in saving lives endangered as a result of accidents.

In attempts to curb grade crossing accidents, H.R. 182, introduced by Representative Gross (Rep.-Iowa), and H.R. 3484, introduced by Representative Ford (Rep.-Mich.) would direct the Interstate Commerce Commission to require freight and other unlighted cars to be equipped with reflecting or luminous material.

At the state level, at least 27 Governors have recommended increased programs for highway safety. Among the suggestions are enactment of uniform laws, periodic inspection of motor vehicles, school driver education, speed regulation, more severe penalties for drunken driving, re-examination of drivers, additional highway patrolmen, improved traffic courts, better accident records, adequate funds for safety programs, and increased public support of official programs.

### Progress on Interstate Program

**A**CCORDING to a recent announcement by the U. S. Bureau of Public Roads, federal interstate funds totaling \$900 million have been obligated to projects since passage of the Federal Aid Highway Act of 1956.

These interstate system projects have a total estimated cost of nearly \$1.2 billion and provide for construction of 974 miles of the system. The total costs are almost equally divided between actual construction, \$547 million, and preliminary engineering and right-of-way acquisition, \$631 million.

Construction contracts awarded during the 8 months since passage of the 1956 Act have a total

estimated cost of \$441 million, including \$363 million of federal-aid funds, for construction of 791 miles of the interstate system.

### Convention Draws Record Attendance

(Continued from Page 11)

Several companies were represented by more than one contest-winning plant. Honored with three award-winning plants were the Columbia Quarry Company; the Standard Lime and Cement Company; the Superior Stone Company, and the Warner Company, while the General Crushed Stone Company, the Kentucky Stone Company and the New Haven Trap Rock Company each placed two plants in the total of the 30 winners in the 1955 NCSA Safety Contest.

## WINNERS 1955 NCSA Safety Contest

MAN-HOURS  
WITHOUT  
A LOST-TIME  
ACCIDENT

264,075

### WINNER

**BELL MINE** Bellefonte, Centre County, Pa.  
WARNER COMPANY, BELLEFONTE DIVISION  
HERSCHELL A. GORD, Supt.

### HONORABLE MENTION

279,230	BESSEMER QUARRY	BESSEMER Limestone & CEMENT CO.
277,587	QUARRY NO. 3	COLUMBIA QUARRY CO.
272,987	QUARRY NO. 1	GENERAL CRUSHED STONE CO.
187,216	OLEN MILLS QUARRY	COLUMBIA QUARRY CO.
180,140	KRAUSE QUARRY NO. 1	NORTH AMERICAN CEMENT CORP.
140,066	SECURITY QUARRY	FEDERAL CRUSHED STONE CO.
130,142	CREEK TOWNSHIP QUARRY	STANDARD LIME & CEMENT CO.
116,325	KIMBALLTON MINE	CALLANAN ROAD IMPROVEMENT CO.
114,800	PLANT NO. 1 QUARRY	GENERAL CRUSHED STONE CO.
101,953	WHITE HAVEN QUARRY	SUPERIOR STONE CO.
94,644	JAMESTOWN QUARRY	SUPERIOR STONE CO.
91,159	BELGRADE QUARRY	CONSUMERS CO.
83,439	IVES QUARRY	STANDARD LIME & CEMENT CO.
76,608	BAKERTON MINE	WARNER CO.
69,044	CEDAR HOLLOW QUARRY	STANDARD LIME & CEMENT CO.
63,924	MARTINSBURG QUARRY	NEW HAVEN TRAP ROCK CO.
63,924	PLANT NO. 1 QUARRY	SUPERIOR STONE CO.
62,887	BAKERS QUARRY	KENTUCKY STONE CO.
60,667	YELLOW ROCK MINE	VALLEY DOLOMITE CORP.
60,320	BONNE TERRE QUARRY	NEW HAVEN TRAP ROCK CO.
52,201	PLANT NO. 4 QUARRY	WARNER CO. (Bellefonte Div.)
41,905	UNION FURNACE QUARRY	EASTERN ROCK PRODUCTS, INC.
37,328	PROSPECT STONE PLANT NO. 6	FEDERAL MATERIALS CO.
36,000	CAPE CHARDEAU MINE	GENESSEE STONE PRODUCTS CORP.
34,176	STAFFORD QUARRY	JEFFERSON COUNTY STONE CO.
27,104	AVOCA QUARRY	KENTUCKY STONE CO.
21,914	BOONESBORO MINE	COLUMBIA QUARRY CO.
18,088	MINE NO. 7	SUPERIOR ROCK PRODUCTS CO.
16,184	RANDVILLE QUARRY	SOUTHWEST STONE CO.
14,403	PLANT NO. 4 QUARRY	

Presentation of NCSA SAFETY AWARDS  
TUESDAY LUNCHEON --- FLORIDIAN ROOM

## Manufacturers Division

### National Crushed Stone Association

•

These associate members are morally and financially aiding the Association in its efforts to protect and advance the interests of the crushed stone industry. Please give them favorable consideration whenever possible.

•

**Allis-Chalmers Mfg. Co.**

Milwaukee 1, Wis.

*Crushing, Screening, Washing, Grinding, Cement Machinery; Motors; Texrope Drives; Centrifugal Pumps; Air Compressors; Hauling Equipment; Engines; Tractors*

**Allis-Chalmers Mfg. Co.**

**Buda Division**

Milwaukee 1, Wis.

*Diesel and Gasoline Engines; Material Handling Equipment; Earth Drills*

**American Cyanamid Co.**

**Explosives Department**

30 Rockefeller Plaza, New York 20, N. Y.

*Explosives and Blasting Supplies*

**American Manganese Steel Division**

**American Brake Shoe Co.**

155 North Wacker Drive, Chicago 6, Ill.

*Manganese and Alloy Steel Castings, Power Shovel Dippers, Material Handling Pumps, Reclamation and Hard-Facing Welding Materials, Automatic and Semi-Automatic Welding Machines*

**American Pulverizer Co.**

1249 Macklind Ave., St. Louis 10, Mo.

*Manufacturers of Ring Crushers and Hammermills for Primary and Secondary Crushing and Laboratory Sizes*

**American Steel & Wire Division**

**United States Steel Corp.**

Rockefeller Bldg., 614 Superior Ave., N. W., Cleveland 13, Ohio

*Wire Rope, Aerial Wire Rope Tramways, Electrical Wires and Cables, Welded Wire Fabric, Concrete Reinforcing, Wire Nails, Fencing, Netting*

**Aquadyne Corp.**

89 Terminal Ave., Clark, N. J.

*Dust Control Systems, Truck Bed Separating Agent*

**Atlas Powder Co.**

Wilmington 99, Del.

*Industrial Explosives and Blasting Supplies*

**Bacon-Greene & Milroy**

29 Washington Ave., Hamden 14, Conn.

*"Farrel-Bacon" Jaw Crushers for Primary and Secondary Operations, Conveyors, Elevators, Rolls, Screens*

**Baldwin-Lima-Hamilton Corp.**

**Construction Equipment Division**

South Main St., Lima, Ohio

*Power Shovels, Draglines, Cranes, Bins, Conveyors and Idlers, Crushers and Pulverizers, Feeders, Plants—Crushing and Portable, Washing Equipment, Asphalt Plants, Dust Control Equipment, Roadpacker*

**Barber-Greene Co.**

400 North Highland Ave., Aurora, Ill.

*Portable and Permanent Belt Conveyors, Belt Conveyor Idlers, Bucket Loaders, Asphalt Mixing Plants and Finishers, Bucket Elevators, Screens*

**Birdsboro-Buchanan Crusher Dept.**

**Birdsboro Steel Foundry and Machine Co.**

1941 Furnace St., Birdsboro, Pa.

*Primary and Secondary Crushers and Rolls*

**Boston Woven Hose & Rubber Co.**

Boston 3, Mass.

*Conveyor, Elevator, and Transmission Belts, V-Belts; Sand Blast, Water, Steam, Air, Suction Hoses*

**Brunner & Lay Rock Bit of Asheville, Inc.**

P. O. Box 5235, Asheville, N. C.

*Tungsten Carbide Detachable Bits, "Rock Bit" Drill Steel Inlaid with Tungsten Carbide, Carbon Hollow Drill Steel, Alloy Hollow Drill Steel*

**Bucyrus-Erie Co.**

South Milwaukee, Wis.

*Excavating, Drilling, and Material Handling Equipment*

**Canadian Industries Ltd.**

P. O. Box 10, Montreal, Que., Canada

*Commercial Explosives and Blasting Accessories*

**Cape Ann Anchor & Forge Co.**

P. O. Box 360, Gloucester, Mass.

*"Cape Ann" Forged Steel Drop Balls*

## Manufacturers Division — National Crushed Stone Association (continued)

### **Caterpillar Tractor Co.**

Peoria 8, Ill.

*Track-Type Tractors, Bulldozers, Earthmoving Scrapers, Motor Graders, Heavy-Duty Off-Road Hauling Units, Diesel Engines, Diesel Electric Generating Sets, Front End Shovels, Wheel-Type Tractors*

### **Chain Belt Co.**

P. O. Box 2022, Milwaukee 1, Wis.

*Rex Conveyors, Elevators, Feeders, Idlers, Elevator Buckets, Drive and Conveyor Chains, Sprockets, Bearings, Pillow Blocks, Power Transmission Equipment, Portable Self-Priming Pumps, Concrete Mixers, Iron Castings, Clutches*

### **Clark Equipment Co.**

#### **Construction Machinery Division**

P. O. Box 599, Benton Harbor, Mich.

*Tractor Shovels; Tractor Dozers; Tractor Scrapers; Truck and Crawler Excavator-Cranes*

### **Continental Gin Co.**

#### **Industrial Division**

4500 Fifth Ave., S., Birmingham 2, Ala.

*Conveyors—Belt, Screw, Flight, and Under-ground Mine; Elevators—Bucket and Screw; Feeders—Apron, Belt, Reciprocating, Table, and Screw; Drives—V-Belts, Chains and Sprockets, Gears and Speed Reducers*

### **Contractors and Engineers Magazine**

470 Fourth Ave., New York 16, N. Y.  
*Magazine of Modern Construction*

### **Cross Engineering Co.**

P. O. Box 507, Carbondale, Pa.

*Cross Perforated Steel Segments, Sections, Decks, for Vibrating, Shaking, Revolving, and Other Types of Screening Equipment*

### **Cummins Engine Co., Inc.**

Fifth and Union Sts., Columbus, Ind.

*Lightweight Highspeed Diesel Engines (60-600 Hp.) for: On-Highway Trucks, Off-Highway Trucks, Buses, Tractors, Earthmovers, Shovels, Cranes, Industrial and Switcher Locomotives, Air Compressors, Logging Yarders and Loaders, Oil Well Drilling Rigs, Centrifugal Pumps, Generator Sets and Power Units, Work Boats and Pleasure Craft*

### **Dart Truck Co.**

2623 Oak St., Kansas City 8, Mo.

*Off-Highway Trucks—End, Side, Bottom Dumps*

### **Deister Machine Co.**

1933 East Wayne St., Fort Wayne 4, Ind.

*Deister Vibrating Screens, Classifiers, Washing Equipment*

### **Detroit Diesel Engine Division**

#### **General Motors Corp.**

13400 West Outer Drive, Detroit 28, Mich.

*Light Weight, Compact 2 Cycle Diesel Engines; Electric Generator Sets*

### **Diamond Iron Works**

#### **Division Goodman Manufacturing Co.**

Halsted Street & 48th Place, Chicago 9, Ill.

*Jaw and Roll Crushers; Vibrator, Revolving, and Scrubber Screens; Drag Washers; Bucket Elevators; Belt Conveyors; Bins; Apron and Plate Feeders; Portable Gravel and Rock Crushing, Screening, and Washing Plants; Stationary Crushing, Screening, and Washing Plants; Hammermills*

### **Drill Carrier Corp.**

1701 Shenandoah Ave., N. W., Roanoke, Va.

*"Air-Trac" Drill Carrier*

### **Du Pont Company of Canada Limited**

85 Eglinton Ave., Toronto, Ont., Canada

*Explosives and Blasting Supplies*

### **Du Pont, E. I., de Nemours & Co.**

Wilmington 98, Del.

*Explosives and Blasting Supplies*

### **Dustex Corp.**

1758 Walden Ave., Buffalo 25, N. Y.

*Dust Collecting Equipment; Dust Control Systems; Feeders*

### **Eagle Crusher Co., Inc.**

900 Harding Way East, Galion, Ohio

*Crushers, Pulverizers, Hammermills, 4-cage Disintegrating Mills*

### **Eagle Iron Works**

129 Holcomb Ave., Des Moines 13, Iowa

*Fine Material Screw Washers — Classifiers — Dehydrators; Coarse Material Screw and Log Washers — Dewaterers; Water Scalping and Fine Material Settling Tanks; Drop Balls — Ni-Hard and Semi-Steel; "Swintek" Screen Chain Cutter Dredging Ladders; Revolving Cutter Head Dredging Ladders*

### **Easton Car & Construction Co.**

Easton, Pa.

*Off-Highway Transportation: Dump Trailers, Truck Bodies, and Cars for Mines, Quarries, and Earth Moving*

### **Electric Steel Foundry Co.**

2141 N. W. 25th Ave., Portland 10, Oreg., and 1017 Griggs St., Danville, Ill.

*Dragline Buckets, Shovel Dippers, Bucket Teeth, Crusher Wearing Parts, Cutting Edges and End Bits*

### **Ensign-Bickford Co.**

Simsbury, Conn.

*Primacord-Bickford Detonating Fuse and Safety Fuse*

## Manufacturers Division — National Crushed Stone Association

(continued)

### Euclid Division

#### General Motors Corp.

1361 Chardon Road, Cleveland 17, Ohio

Heavy-Duty Trucks and Dump Trailers for "Off-Highway" Hauls, Loaders for Earth Excavation, Single and Twin Engine Earth Moving Scrapers, Crawler Tractors

### Frog, Switch & Mfg. Co.

#### Manganese Steel Department

Carlisle, Pa.

"Indian Brand" Manganese Steel Castings for all Types of Jaw, Gyratory, and Pulverizing Crushers; Dippers, Teeth, Treads, and Other Parts for Power Excavating Equipment; and Other Miscellaneous Manganese Steel Castings. Manufacturers and Fabricators of Railroad and Mine Frogs, Switches, and Crossings

### General Electric Co.

1 River Road, Schenectady 5, N. Y.

Electric Motors, Controls, Locomotives, Welding Equipment, Coordinated Electric Drives for: Shovels, Drag Lines, Conveyors, Hoists, Cranes, Crushers, Screens, Etc.; Coordinated Power Generating and Distributing Systems Including Generators, Switchgear, Transformers, Cable, Cable Skids, Load Center Substations

### Gill Rock Drill Co., Inc.

Lebanon, Pa.

Well Drill Tools and Supplies

### Goodrich, B. F., Industrial Products Co.

500 S. Main St., Akron, Ohio

Belting—Conveyor and V-Belts, Hose, and Industrial Rubber Products

### Goodyear Tire & Rubber Co., Inc.

Akron 16, Ohio

Airfoam; Industrial Rubber Products—Belting (Conveyor, Elevator, Transmission), Hose (Air, Water, Steam, Suction, Miscellaneous); Chute Lining (Rubber); Rims (Truck and Tractor); Storage Batteries (Automobile, Truck, Tractor); Tires (Automobile, Truck, Off-the-Road); Tubes (Automobile, Truck, Off-the-Road, LifeGuard, Safety Tubes, Puncture Seal Tubes)

### Gulf Oil Corp.

#### Gulf Refining Co.

Gulf Bldg., Pittsburgh 19, Pa.

Lubricating Oils, Greases, Gasoline and Diesel Fuels

### Haiss, George, Mfg. Co., Inc.

#### Division of Pettibone Mulliken Corp.

5720 Empire State Bldg., New York 1, N. Y.

Bucket Loaders, Buckets, Portable and Stationary Conveyors, Car Unloaders

### Harnischfeger Corp.

4400 West National Ave., Milwaukee 46, Wis.

A Complete Line of Power Excavating Equipment, Overhead Cranes, Hoists, Welders, Electrodes, Motors and Generators, Diesel Engines

### HarriSteel Products Co.

420 Lexington Ave., New York 17, N. Y.

Woven Wire Screen Cloth

### Hayward Co.

50 Church St., New York 7, N. Y.

Orange Peel Buckets, Clam Shell Buckets, Electric Motor Buckets, Automatic Take-up Reels

### Heidenreich, E. Lee, Jr.

#### Consulting Engineers

75 Second St., Newburgh, N. Y.

Plant Layout, Design, Supervision; Open Pit Quarry Surveys; Appraisals — Plant and Property

### Hendrick Mfg. Co.

Carbondale, Pa.

Perforated Metal Screens, Perforated Plates for Vibrating, Shaking, and Revolving Screens; Elevator Buckets; Test Screens; Wedge Slot Screens; Wedge Wire Screens; Open Steel Floor Grating

### Hercules Powder Co.

Wilmington 99, Del.

Explosives and Blasting Supplies

### Hetherington & Berner Inc.

701-745 Kentucky Ave., Indianapolis 7, Ind.

Asphalt Paving Machinery, Sand and Stone Dryers

### Hewitt-Robins Incorporated

666 Glenbrook Road, Stamford, Conn.

Belt Conveyors (Belting and Machinery); Belt and Bucket Elevators; Car Shakeouts; Feeders; Industrial Hose; Screen Cloth; Sectional Conveyors; Skip Hoists; Stackers; Transmission Belting; Vibrating Conveyors, Feeders, and Screens; Design and Construction of Complete Plants; Molded Rubber Goods; Sheet Packing; Transmission Belting; De-waterizers; Wire Conveyor Belts; Speed Reducers; Gears; Pulleys; Sheaves; Couplings

### Howe Scale Co.

Strongs Ave., Rutland, Vt.

Scales, Static Weighing and Motion Weighing Devices, Automatic Batching Equipment, and Hand Trucks

### Hoyt Wire Cloth Co.

Abraso St., off Manheim Pike, Lancaster, Pa.

Aggregate Wire Screens Made of Supertough, Abraso, and Stainless Steel Wire—Smooth-top, Longslot, Oblong Space, and Double Crimp Construction—For All Makes of Vibrators

### Hughes Tool Co.

P. O. Box 2539, Houston 1, Texas

Bits—Rock

### Illinois Powder Mfg. Co.

506 Olive St., St. Louis 1, Mo.

Gold Medal Explosives



## Manufacturers Division - National Crushed Stone Association

(continued)

### Ingersoll-Rand Co.

11 Broadway, New York 4, N. Y.

Rock Drills, Paving Breakers, Paving Breaker Accessories, Quarrymaster Drills, Drillmasters, Carset Bits, Jackbits, Bit Reconditioning Equipment, Portable and Stationary Air Compressors, Air Hoists, Slusher Hoists, Pneumatic Tools, Centrifugal Pumps, Diesel and Gas Engines

### Insley Manufacturing Corp.

801 North Olney St., Indianapolis 6, Ind.

1/2 to 1 Cu. Yd. Cranes and Shovels—5 to 35 Tons Capacity, Rubber or Crawler Mounting; Concrete Carts and Buckets

### International Harvester Co.

#### Construction Equipment Division

P. O. Box 270, Melrose Park, Ill.

Tractors (Crawlers) and Equipment; Off-Highway Trucks

### Iowa Manufacturing Co.

916 16th St., N.E., Cedar Rapids, Iowa

Rock and Gravel Crushing, Screening, Conveying and Washing Plants, Asphalt Plants, Stabilizer Plants, Impact Breakers, Screens, Elevators, Conveyors, Portable and Stationary Equipment, Hammermills, Bins

### Jaeger Machine Co.

550 West Spring St., Columbus 16, Ohio

Portable and Stationary Air Compressors, Self-Priming Pumps, Truck Mixers, Concrete Mixers, Road Paving Machinery, Hoists and Towers; Rubber-Tired, Front End Loaders

### Jeffrey Manufacturing Co.

East First Ave., Columbus 16, Ohio

Elevator Buckets; Car Pullers; Chains; Conveyors; Belt, Drag, Apron, Vibrating; Idlers; Crushers; Pulverizers; Elevators; Feeders; Pillow Blocks; Stationary Plants; Screens

### Johnson-March Corp.

1724 Chestnut St., Philadelphia 3, Pa.

Dust Control Engineers, Chem-Jet Dust Control Systems, Gas Scrubbers

### Joy Manufacturing Co.

333 Henry W. Oliver Bldg., Pittsburgh 22, Pa.

Drills: Blast-Hole, Wagon, Rock, and Core; Air Compressors: Portable, Stationary, and Semi-Portable; Aftercoolers; Portable Blowers; Carpullers; Hoists; Multi-Purpose and Portable Rock Loaders; Air Motors; Trench Diggers; Belt Conveyors; "Spaders"; "String-a-Lite" (Safety-Lighting-Cable); Backfill Tampers; Drill Bits: Rock and Core

### Kennedy-Van Saun Mfg. & Eng. Corp.

2 Park Ave., New York 16, N. Y.

Crushing, Screening, Washing, Conveying, Elevating, Grinding, Complete Cement Plants, Complete Lime Plants, Complete Lightweight Aggregate Plants, Synchronous Motors, Air Activated Containers for Transportation of Pulverized Material, Cement Pumps, and Power Plant Equipment

### Kensington Steel

#### Division of Poor & Co.

505 Kensington Ave., Chicago 28, Ill.

Oro Alloy and Manganese Steel Castings: For Shovels—Dipper Teeth, Crawler Treads, Rollers, Sprockets; For Crushers—Jaw Plates, Concaves, Mantles, Bowl Liners; For Pulverizers—Hammers, Grate Bars and Liners; For Elevators and Conveyors—Chain, Sprockets, Buckets; For Tractors—Rail Links and Grouser Plates; Drag Line Chain

### King Powder Co., Inc.

Cincinnati, Ohio

Detonite, Dynamites, and Blasting Supplies

### Koehring Co.

3026 West Concordia Ave., Milwaukee 16, Wis.

Excavating, Hauling, and Concrete Equipment

### Linde Air Products Co., Division of

#### Union Carbide and Carbon Corp.

30 East 42nd St., New York 17, N. Y.

Oxygen, Acetylene, Welding and Jet Piercing Equipment and Supplies

### Link-Belt Co.

300 West Pershing Road, Chicago 9, Ill.

Complete Stone Preparation Plants; Conveyors, Elevators, Screens, Washing Equipment, Speed-O-Matic Shovels—Cranes—Draglines and Power Transmission Equipment

### Link-Belt Speeder Corp.

1201 Sixth St., S. W., Cedar Rapids, Iowa

Complete Line of Power Hydraulically Controlled Cranes, Shovels, Hoes, Draglines, Clamshells, 1/2 to 3 Yd. Capacities. Available on Crawler Base or Rubber Tire Mounting

### Lippmann Engineering Works, Inc.

4603 W. Mitchell St., Milwaukee 14, Wis.

Primary and Secondary Rock Crushers and Auxiliary Equipment such as Feeders, Screens, Conveyors, Etc., Portable and Stationary Crushing and Washing Plants

### Ludlow-Saylor Wire Cloth Co.

634 South Newstead Ave., St. Louis 10, Mo.

Woven Wire Screens and Wire Cloth of Super-Loy, Steel, and All Other Commercial Alloys and Metals

### Mack Trucks, Inc.

P. O. Box 311, Somerville, N. J.

On- and Off-Highway Trucks, Tractor-Trailers, Six-Wheelers, from 5 to 100 Tons Capacity, Both Gasoline- and Diesel-Powered

### Manganese Steel Forge Co.

Richmond St. & Castor Ave., Phila. 34, Pa.

ROL-MAN 11.00 to 14.00 Per Cent Rolled Manganese Steel Woven and Perforated Screens, and Fabricated Parts for Aggregate Handling Equipment



## Manufacturers Division – National Crushed Stone Association (continued)

### **Marion Power Shovel Co.**

Marion, Ohio  
Power Shovels, Draglines, Cranes, Truck  
Cranes—From 1/2 to 75 Yd.

### **McLanahan & Stone Corp.**

252 Wall St., Hollidaysburg, Pa.  
Complete Pit, Mine, and Quarry Equipment—  
Crushers, Washers, Screens, Feeders, Etc.,  
Semi-Portable Plants

### **Murphy Diesel Co.**

5317 West Burnham St., Milwaukee 14, Wis.  
Engines—Industrial Engine, and Power Units  
for Operation on Diesel and Dual Fuel En-  
gines. Generator Sets, AC and DC from  
64 Kw. to 165 Kw. Mech-Elec Unit—Com-  
bination Mechanical and Electric Power  
Furnished Simultaneously

### **New York Rubber Corp.**

100 Park Ave., New York 17, N. Y.  
Conveyor Belting: *Stonore*, Dependable, and  
Cameo Grades; Transmission Belting: *Silver  
Duck Duroflex*, Soft *Duck Rugged*, Commer-  
cial Grade Tractor

### **Nordberg Mfg. Co.**

Milwaukee 1, Wis.  
Symons Cone Crushers, and Symons Gyratory  
and Impact Crushers; Gyradisc Crushers;  
Grinding Mills; Stone Plant and Cement  
Mill Machinery; Vibrating Screens and  
Grizzlies; Diesel Engines and Diesel Gen-  
erator Units; Mine Hoists; Railway Track  
Maintenance Machinery

### **Northern Blower Co.**

6409 Barberton Ave., Cleveland 2, Ohio  
Dust Collecting Systems, Fans—Exhaust and  
Blower

### **Northwest Engineering Co.**

135 South LaSalle St., Chicago 3, Ill.  
Shovels, Cranes, Draglines, Pullshovels—  
Crawler and Truck Mounted

### **Olin Mathieson Chemical Corp.**

**Explosives Division**  
East Alton, Ill.  
Explosives, Blasting Caps, Blasting Accessories

### **Pennsylvania Crusher Division**

**Bath Iron Works Corp.**  
323 South Matlack St., West Chester, Pa.  
Single Roll Crushers, Impactors, Reversible  
Hammermills, Ring Type Granulators, Kue-  
Ken Jaw Crushers, Kue-Ken Gyratories,  
Non-Clog and Standard One-Way Hammer-  
mills

### **Pettibone Mulliken Corp.**

4710 West Division St., Chicago 51, Ill.  
Material Handling Buckets, Clamshells, Drag-  
lines, Pullshovels, Dippers, Shovel Dippers,  
Pumps, Front End Loaders, Bucket Con-  
veyor Loaders, Fork and Bucket Loaders,  
Speed Swing Loaders, Speed Swing Yard  
Cranes, Motor Graders, Manganese Steel  
Castings

### **Pioneer Engineering Works, Inc.**

3200 Como Ave., Minneapolis 14, Minn.  
Jaw Crushers, Roll Crushers (Twin and Trip-  
ple), Impact Crushers, Vibrating and Re-  
volving Screens, Feeders (Reciprocating,  
Apron, and Pioneer Oro Manganese Steel),  
Belt Conveyors, Idlers, Accessories and  
Trucks, Portable and Stationary Crushing  
and Screening Plants, Washing Plants, Min-  
ing Equipment, Cement and Lime Equip-  
ment, Asphalt Plants, Mixers, Dryers and  
Pavers

### **Pit and Quarry Publications, Inc.**

431 South Dearborn St., Chicago 5, Ill.  
Pit and Quarry, Pit and Quarry Handbook,  
Pit and Quarry Directory, Concrete Manu-  
facturer, Concrete Industries Yearbook,  
Equipment Distributor's Digest

### **Productive Equipment Corp.**

2926 West Lake St., Chicago 12, Ill.  
Vibrating Screens

### **Quaker Rubber Division**

**H. K. Porter Co., Inc.**  
Tacony and Comly Sts., Philadelphia 24, Pa.  
Conveyor Belts, Hose, and Packings

### **Radio Corporation of America Inspection and Control Section**

Front and Cooper Sts., Bldg. 15-1  
Camden 2, N. J.  
Tramp Metal Detectors

### **Rock Products and Concrete Products**

79 West Monroe St., Chicago 3, Ill.

### **Rogers Iron Works Co.**

11th & Pearl Sts., Joplin, Mo.  
Jaw Crushers, Roll Crushers, Hammermills,  
Vibrating Screens, Revolving Screens and  
Scrubbers, Apron Feeders, Reciprocating  
Feeders, Roll Grizzlies, Conveyors, Eleva-  
tors, Portable and Stationary Crushing and  
Screening Plants, Mine Hoists, Drill Jumbos  
and Underground Loaders

### **Schramm, Inc.**

West Chester, Pa.  
Air Compressors, Rotary Drills, Pneumatic  
Drills, Etc.

### **Screen Equipment Co., Inc.**

1754 Walden Ave., Buffalo 25, N. Y.  
Seco Vibrating Screens; Scales—Industrial  
Aggregates, Truck

### **Simplicity Engineering Co.**

Durand, Mich.  
Simplicity Gyating Screens, Horizontal  
Screens, Simpli-Flo Screens, Tray Type  
Screens, Heavy Duty Scalpers, D'Watering  
Wheels, D'Centegrators, Vibrating Feeders,  
Vibrating Pan Conveyors, Car Shake-Outs  
Woven Wire Screen Cloth, Grizzly Feeders

## Manufacturers Division — National Crushed Stone Association

(concluded)

### SKF Industries, Inc.

Front St. and Erie Ave.,  
P. O. Box 6731, Philadelphia 32, Pa.

Anti-Friction Bearings—Self-Aligning Ball, Single Row Deep Groove Ball, Angular Contact Ball, Double Row Deep Groove Ball, Spherical Roller, Cylindrical Roller, Ball Thrust, Spherical Roller Thrust; Tapered Roller Bearings; Pillow Block and Flanged Housings—Ball and Roller

### Smith Engineering Works

532 East Capitol Drive, Milwaukee 12, Wis.

Gyratory, Gyrasphere, Jaw and Roll Crushers, Vibrating and Rotary Screens, Gravel Washing and Sand Settling Equipment, Elevators and Conveyors, Feeders, Bin Gates, and Portable Crushing and Screening Plants

### Stedman Foundry & Machine Co., Inc.

Aurora, Ind.

Stedman Impact-Type Selective Reduction Crushers, 2-Stage Swing Hammer Limestone Pulverizers, Multi-Cage Limestone Pulverizers, Vibrating Screens

### Stephens-Adamson Mfg. Co.

Aurora, Ill.

Belt Conveyors, Pan Conveyors, Bucket Elevators, "Amsco" Manganese Steel Pan Feeders, Vibrating Screens, Belt Conveyor Carriers, Bin Gates, Car Pullers, "Sealmaster" Ball Bearing Units, "Saco" Speed Reducers, and Complete Engineered Stone Handling Plants

### Taylor-Wharton Co.

#### Division Harsco Corp.

High Bridge, N. J.

Manganese and Other Special Alloy Steel and Iron Castings; Dipper Teeth, Fronts and Lips; Crawler Treads; Jaw and Cheek Plates; Mantles and Concaves; Pulverizer Hammers and Liners; Asphalt Mixer Liners and Tips; Manganese Nickel Steel Welding Rod and Plate; Elevator, Conveyor and Dredge Buckets

### Thew Shovel Co.

East 28th St. and Fulton Rd., Lorain, Ohio

"Lorain" Power Shovels, Cranes, Draglines, Clamshells, Hoes, Scoop Shovels on Crawlers and Rubber-Tire Mountings, Diesel, Electric, and Gasoline, 3/8 to 2-1/2 Yd. Capacities

### Thor Power Tool Co.

Prudential Plaza, Chicago 1, Ill.

Wagon Drills, Rock Drills, Sump Pumps, Clay Diggers, Paving Breakers, Quarry Bars, Sinkers, Legs, Drifters, Rock Drilling Jumbos, Raiser Legs, Push Feed Rock Drills, Air and Electric Tools, Accessories

### Torrington Co.

#### Bantam Bearings Division

3702 West Sample St., South Bend 21, Ind.

Anti-Friction Bearings; Self-Aligning Spherical, Tapered, Cylindrical, and Needle Roller; Roller Thrust; Ball Bearings

### Travel Drill Co.

P. O. Box 1124, Raleigh, N. C.

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### Traylor Engineering & Mfg. Co.

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Stone Crushing, Gravel, Lime, and Cement Machinery

### Trojan Powder Co.

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- No. 2. How to Proportion Concrete for Pavements
- No. 3. Uses for Stone Screenings
- No. 4. How to Determine the Required Thickness of the Non-Rigid Type of Pavement for Highways and Airport Runways
- No. 5. The Insulation Base Course Under Portland Cement Concrete Pavements

## ***ENGINEERING BULLETINS***

- No. 1. The Bulking of Sand and Its Effect on Concrete
- No. 2. Low Cost Improvement of Earth Roads with Crushed Stone
- No. 4. "Retreading" Our Highways
- No. 5. Reprint of "Comparative Tests of Crushed Stone and Gravel Concrete in New Jersey" with Discussion
- No. 7. Investigations in the Proportioning of Concrete for Highways
- No. 9. Tests for the Traffic Durability of Bituminous Pavements
- No. 11. A Method of Proportioning Concrete for Strength, Workability, and Durability. (Revised November 1953)

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*Single copies of the above publications are available upon request.*

